DOCUMENT RESUME

ED 146 102 SO 010 447

AUTHOR	Fryxell, Roald
TITLE	The Interdisciplinary Dilemma: A Case for Flexibility in Academic Thought. Occasional Paper No. 13.
INSTITUTION	Augustana Coll., Rock Island, Ill.
PUB DATE	77
NOTE	16p.
AVAILABLE FROM	Augustana College Library, Rock Island, Illinois 61201 ($1.00, paper cover)
EDRS PRICE	MF-$0.83 Plus Postage. HC Not Available from EDRS.
DESCRIPTORS	Academic Education; *Anthropology; Archaeology; Educational Needs; Educational Problems; Higher Education; *Interdisciplinary Approach; *Natural Sciences; *Social Sciences

ABSTRACT

The need for interdisciplinary education has been brought about by the disintegration of traditional academic boundaries. Presently, for example, archeologists destroy valuable botanical, zoological, and stratigraphic evidence as a result of insufficient multidisciplinary skills. In establishing an interdisciplinary study, the field of anthropology should be the means for coordinating seemingly unrelated studies since this discipline offers the opportunity to explore relationships between the social and biophysical sciences. Such an approach is not meant to replace traditional programs; rather, it is an option which offers new intellectual frontiers. Students seeking an interdisciplinary education should be given all possible assistance. (KC)

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THE INTERDISCIPLINARY DILEMMA

A Case for Flexibility in Academic Thought

By

ROALD FRYXELL

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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OCCASIONAL PAPER, No. 13
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Roald Fryxell.

Roald Fryxell (1934-1974) was Associate Professor of Anthropology at Washington State University, Pullman, Washington, where he was Director of the Quaternary Studies Option and of the Marmes Research Program. He studied at Augustana College (Rock Island, Illinois), Washington State University, and the University of Idaho where he received his doctorate. Throughout the series of Apollo Missions, he was a member of NASA's Lunar Sample Preliminary Examination Team and of the Subcommittee on Core Samples for the Lunar Sample Analysis Team.

Foreword

Roald Fryxell's special interest in the interrelationships of the sciences began early, one might hazard even in the multiplicity of his boyhood natural history pursuits. In high school, for all his strenuous involvement in sports, drama, art, and writing, he won the Bausch and Lomb science award. His divisional major at Augustana College provided for a concentration in geology while it encouraged him to elect many courses in the other sciences. In his graduate-school years at Washington State University and the University of Idaho he held to the same pattern, but with even greater breadth to his geology major (emphasizing glacial studies) he added advanced courses in other disciplines, including three new ones, ecology, pedology and archaeology. Under Henry W. Smith he gained the insight into the origin, characteristics and classification of soils, and the techniques essential for their description and interpretation that he later adapted with great originality for geologic and archaeologic purposes, and in his pioneering studies of lunar core samples. Under Richard D. Daugherty he first utilized geologic and pedologic methods for dating archaeological finds. Here were exciting new challenges of irresistible appeal. Having embraced them, he never looked back. His doctoral dissertation, at the University of Idaho, dealt with *The Contribution of Interdisciplinary Research to Geologic Investigation of Prehistory, Eastern Washington.* It was a 500-page compendium of papers already published.

The personal story behind all this cannot be reviewed here, but one event should be noted– the adoption by the Department of Anthropology at Washington State University of a Quaternary Studies Option, an innovative plan by which candidates for higher degrees could gain the sort of broad

training that Fryxell had staunchly advocated. From the success of the plan he derived solid satisfaction. He was also led to spell out on paper his views respecting "the interdisciplinary dilemma" as he had articulated them at Washington State University and elsewhere. The resultant essay was reviewed by some of his colleagues, but had to be laid aside during the five-year period when, in addition to his university responsibilities, he was assigned a major role in the study of the unique lunar samples being returned by the Apollo astronauts. Final work on this and other papers was planned for his first sabbatical, to begin in September 1974. This was not to be, his accidental death occurring on May 18, 1974.

Colleagues who have read Fryxell's essay feel that, although it was denied the author's final revisions, it is nevertheless, an eloquent and "beautifully written statement" of the philosophy that guided his career, and profoundly influenced all with whom he worked. Its publication as an Occasional Paper of the Augustana College Library is appropriate, since the ideas expressed in it were voiced on many occasions, from different points of view, when Roald Fryxell addressed faculty-student audiences on the Augustana College campus.

In a note accompanying this manuscript the author wrote: "For many helpful discussions and kind efforts to improve this essay, I am indebted to R. E. Ackerman, Rexford Daubenmire, Richard Daugherty, Fritiof Fryxell, Redwood and Penelope Fryxell, Richard Foster Flint, Henry Grosshans, Carl Gustafson, Harold Malde, Peter Mehringer, Jr., Michael Saso, Allan H. Smith, and H. Marie Wormington. Opportunities to consider the problems and possibilities of interdisciplinary study have been provided by work with the National Aeronautics and Space Administration, National Park Service, National Science Foundation (especially NSF Grant CZ-1353 in support of the Quaternary Studies Option) and Washington State University. I am equally indebted to my own graduate students, from whom I have learned much." This statement of acknowledgments was probably written in late 1972, and the manuscript may have been reviewed subsequently by a few individuals who cannot now be identified.

Richard C. Anderson
Chairman, Geology Department
Augustana College

THE INTERDISCIPLINARY DILEMMA
A CASE FOR FLEXIBILITY IN ACADEMIC THOUGHT*

Roald Fryxell

Spanning the last million years or so of earth history, the Quaternary has seen many remarkable developments, including the ascendancy of man. All man's social and cultural patterns up to the present time have been developed in the excitingly diverse ecosystem of the Quaternary. Just as a study of man and his history requires investigation of the preexisting world, so also the changing ecosystem of today's world can be adequately described and analyzed only with reference to man. The study of environment is indispensable to the study of man.

It is not surprising then that, in the burgeoning study of the Quaternary, anthropology—particularly through archaeology and physical anthropology—should be an important catalyst. Yet, the unpreparedness of most students in both anthropology and the related biophysical sciences for contributions of reciprocal benefit poses a problem, one that prompts this essay. This interdisciplinary dilemma is, of course, by no means limited to anthropologists, for it is shared by workers in many fields throughout the world as traditional academic boundaries disintegrate and become meaningless. Witness the destruction of the essential distinctions between much of chemistry and physics and botany and zoology; also the birth of vigorous hybrids such as molecular biology, geophysics and geochemistry.

These trends should not daunt or discourage Quaternary students for they need only look about them to note how in the achievements of interdisciplinary efforts lie many of the most promising intellectual frontiers open today. Indeed, in these

*Views expressed in this essay stem almost equally from the influences of a liberal arts education, the perspectives of prehistory and the first superb views of our earth from outer space. R. F.

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very frontiers students may, perhaps, discover their own most effective means of making distinctive contributions. Experiences in the anthropology laboratories at Washington State University suggest that some of the most useful ideas have come from teaching and research conducted with concern for the solution of problems regardless of their academic pigeon-holes. For example, methods devised for detailed exploration of unconsolidated sediments at the ancient Marmes Rockshelter Archaeological Site in Washington were adapted for handling and study of the first lunar core samples returned to earth by the Apollo program; and results of experiments at NASA's Manned Spacecraft Center in Houston now are being applied to the study and preservation of materials left by Neanderthals of Mousterian culture at a cave near Granada in southern Spain. Other illustrations from this institution and from departments elsewhere are by no means rare. As a geologist trained in pedology and employed by a department of anthropology for studies involving human prehistory, I find that the desirability of interdisciplinary training for those who wish it seems so self-evident as to warrant the position that all possible assistance should be given students seeking this avenue of personal fulfillment.

Pragmatic industrialists have so long used the interdisciplinary "think tank" and recognized the importance of its unpredictable "spin off benefits" that these expressions have become cliches, but many academics have lagged in becoming dissatisfied with traditional compartmentalization.

The interdisciplinary dilemma can perhaps best be understood in terms of its historical development. In many respects we have come full circle since the intellectual ferment of the Renaissance. Then a bright young scholar might be taught reasonable competence in all that was known to be important. The people of that impressively creative age revelled in the wonder of the oneness of life and the intricacies of its ramifications. The unity of design and integral organization which permeates the art of the period was no accident, nor was the excitement of discovery generated by realization that the anatomy of the world and of life could be methodically studied in detail. It was the organization of the expanding wealth of such detailed data which led to the establishment of our present

academic disciplines. The creative energy and curiosity of the period, together with the concentration of attention and resources on problems within that organized academic framework, in turn made possible the following technological revolution. Thus, the intellectual spark kindled during the Renaissance was responsible for the tremendous acceleration of academic and technical advances of the eighteenth, nineteenth and early twentieth centuries.

This very concentration of intellectual and economic resources on compartmentalized knowledge has, however, expanded the limits of the various fields until, as noted, their respective boundaries have ceased to be significant; and the farther that divergent specialized studies have progressed, the more stimulating and the more valuable has become the exploration of the unknown interfaces. Thus, once again we have the opportunity—in fact, the necessity—for synthetic studies.

It is natural that anthropology should be a means for coordinating seemingly unrelated studies, for anthropology is essentially a synthetic discipline which draws upon data and ideas from tangent fields as diverse as art and zoology. No other field offers more intriguing opportunities to explore the relationship between social and biophysical sciences, and no other field depends more on both academic hemispheres for competence in its own investigations. The early intimations of archaeology and physical anthropology begun in established fields of biophysical science a century ago failed to develop there. Instead, the impetus has come from social sciences: in the New World, departments of anthropology have often sprung from the sociology programs they originally were designed to service. Their resulting emphasis on concepts and techniques borrowed from sociology and the humanities is both understandable and productive, but any continuing neglect of basic biophysical facts and methods is lamentable. Man is a biological organism living in a physical world. He must, therefore, be considered in terms of his natural habitat as well as his social context. Problems involving man and his environment will prove tractable only if approached in a balanced way.

The great advantages of an environmental approach to anthropological problems have indeed come to be evident,

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especially since World War II. Ecological considerations previously ignored have tempered our concepts of man's environment and his adaptation to it, just as more refined techniques of dating have drastically revised our knowledge of man's antiquity and evolutionary history. In the New World, the pioneer studies of Kirk Bryan and Ernst Antevs clearly demonstrated the value of adding dimensions other than archaeology to prehistory; and the sustained high quality of interdisciplinary studies by European scientists with broad training—such as Kenneth Oakley and Graham Clarke in England, Francois Bordes in France, and Laszlo Vertes in Hungary—has proven the value of a comprehensive outlook. But not all archaeologists have breadth of training comparable to these men, and few archaeologists have at their command the great resources or specialists effectively used during recent years in a few experimental interdisciplinary research programs. Instead, the vast majority of archaeologists must work as individuals and must assume sole responsibility for all results of every aspect of research and interpretation under their direction. These rank-and-file archaeologists urgently need expanded training because they must operate on a budget too modest to provide for the services of highly trained specialists.

Anthropological training must be made to keep pace with the press for environmental interpretation. The dilemma of persons trained in the traditional way but who require in practice at least some technical skills derived from an interdisciplinary training is very evident in the present-day field of North American archaeology and particularly in studies of Early Man.

Probably no group of scientists is more destructive than archaeologists—necessarily so. Not only do they progressively destroy sites as they dig them, but in the process they commonly destroy potentially precious accessory evidence which the biophysical sciences could render relevant. Botanical, zoological and stratigraphic evidence are cases in point. The first step customarily taken at an archaeological site is to clear the area of vegetation to permit surveying and excavation. Yet precisely this vegetation may provide valuable ethnobotanical data and palynological evidence of environmental conditions existing at the time of human occupation. If a botanist or

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palynologist is even afforded the opportunity of visiting the area, he may be too late to do more than infer the general type of habitat represented by the site. Similarly, zoological remains are frequently regarded as less important than artifacts, and insufficient attention and technical skills are devoted to them. Sampling becomes biased, specimens are lost or even destroyed, and what is collected is ignominiously consigned to the levels bags. Yet, the remains of foodstuffs consumed at the site are just as direct evidence of cultural activity as are the artifacts used to collect and prepare them.

Stratigraphic evidence frequently suffers also. Archaeologists may be unfamiliar with some of the most basic tenets of geology and pedology; consequently, they may scrape trench walls clean and smooth, destroying the pedologic structures without which soil profiles often cannot be recognized and interpreted. Specialists engaged to study pedology are all too frequently then discouraged or prohibited from tearing apart the trench walls in order to get at the evidence. Samples collected to document such profiles or the strata of midden and geologic components in the site generally are insufficient in number or volume, or are improperly placed. Many published stratigraphic drawings purporting to demonstrate physical stratigraphy and the provenience of associated artifacts reveal implausible or even impossible stratigraphic relationships which an elementary grasp of the Law of Superposition would have prevented.

Obviously these violations of the record are not intentional; they result from workers having insufficient multidisciplinary technical skills. The archaeologist must straddle the boundary between two academic worlds—that of the social scientist and the humanities, and that of the biophysical sciences—and the evolution of traditional archaeological training has taken place in the first of these worlds to the near exclusion of the second.

Noteworthy also is the fact that in archaeology descriptive techniques dominated in the past, but the trend now is increasingly toward more quantitative and analytical methods of research. As a result, archaeologists find it more and more difficult to communicate with other specialists who might be called in as consultants. Thus two situations require solution:

archaeologists need opportunities for training in related fields of science to permit them to work effectively with the men in those fields; and, conversely, the scientists in those related fields need some training and experience in archaeology.

Admittedly, it is often difficult and sometimes impossible for archaeologists to find scientists in related fields who have the training or interest in archaeology to give them the help needed. Geologists seldom have any archaeological experience and frequently know little or nothing of soils. Soils scientists generally lack the temporal perspective essential to serve as consultants on problems involving Quaternary sediments of either geological or archaeological prehistory. And fewer soils scientists realize that they themselves are among those who might gain most from archaeological research. The problem of having faunal remains from archaeological sites identified and interpreted is also in many respects typical of the interdisciplinary dilemma: archaeological sites are generally too old to be interesting to zoologists and too young to attract the attention of paleontologists. In dating faunal remains, the archaeologist is all too often left to his own resources.

If the archaeologist cannot, as he probably should not, attempt to gain competence for interpretation of all, or some, of these types of data, he can, and emphatically should, learn to collect, preserve, or record many of them for interpretation by others. If he is limited in his attempts to learn how to salvage data other than artifacts, he must at least be able to recognize, describe and record the physical stratigraphy exposed by his excavations. Without documentation of physical stratigraphy even the simplest relative chronology has no basis, and the most elementary cultural interpretations are suspect. Without the data of physical stratigraphy, the temporal and cultural relevance of the most carefully collected biological remains can never be demonstrated; and even sophisticated chemical and mechanical analyses of midden and related deposits are meaningless unless they are unequivocably demonstrated with respect to their field relationships. Without physical stratigraphic documentation, none of these types of data can be relied upon, correlated with each other, or legitimately used for interpretation. In short, data without documentation do not constitute evidence, and without evidence interpretations can-

not be demonstrated. Accurate and precise description and documentation of physical stratigraphy, and demonstration of the provenience of specimens of any kind removed from the section, are the minimal expectations of capability.

Perusal of current publications reveals the fact that few Quaternary geologists and fewer archaeologists have received the interdisciplinary training necessary to achieve results fully acceptable to workers in the field related to their own.

Most archaeologists who received their training in the past lacked the opportunity for substantial training in the biophysical sciences, and many students now in college discover too late that they have neglected the hard sciences in which they might have minored. Unfortunately, physical and biological sciences represent precisely those fields in which strong background training becomes most essential when environmental studies are needed, or as problems of prehistory reach farther back in time. Obviously, the need for archaeologists trained in the traditional facets of anthropology, especially ethnology, still exists. But it is evident now that providing some archaeologists with strong training in physical and biological sciences—or with appropriate balance between both kinds of background—is important also and that these needs are not being adequately met.

Archaeologists often explain their deficiences in biophysical matters by noting the obvious need for training soundly based on traditional anthropological theory. They hold that they would gladly seek proficiency in other fields too, but that time simply does not permit this. Geologists and zoologists are apt to express good intentions too, equally earnestly, but they regret that anthropological problems are peripheral to their interests, and the students they are training cannot, therefore, divert energies to study them properly.

If no one will ever meet anyone else half way, who will ever have the background to look competently at the unexplored territory between disciplines? It is a truism that the universal wisdom gained by a renaissance education is no longer possible for a single individual—and especially not within a period of time reasonable for servitude as a graduate student. It does not follow, however, that this renaissance wisdom be denied an entire profession, for individual members of a profession can deploy their energies as their interests and

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abilities permit—toward either the biophysical or the social aspects of man's study of himself—to the ultimate collective benefit of the profession. To limit the training of all individuals pursuing studies of anthropological relevance to traditional graduate programs will only result in the continued incompetence of those anthropologists who must unavoidably deal with the biophysical aspects of their research.

Anthropology departments in the New World are increasingly faced with decisions made necessary by the historical lack of training of at least a reasonable number of anthropologists with biophysical backgrounds. The rapid growth of anthropology, its inherently catholic interests, and the lethargy of many tangent disciplines concerning problems which should be of mutual interest, all lead increasingly to exploration of problems requiring expertise in fields not previously included in anthropological training. Solution to these conditions can be reduced to two alternatives:

Anthropology, as a profession, can refuse to modify the concept of its own valid sphere of study, can develop a more tightly defined philosophy of purpose and purview and can leave studies it considers not sufficiently central to its concept of an anthropological relevance to the related fields on which these studies impinge.

Anthropology, as a profession, can disperse its forces to whatever frontiers of investigation its scholars consider productive, and can see to it that its representatives are trained to bring to those frontiers whatever academic euqipment is most appropriate to solve the problems at hand, even though such an alternative certainly will leave many anthropologists with less competence in physical anthropology or archaeology.

The first of these alternatives can only lead to rigidly dogmatic attempts to define what already are the most diffuse disciplinary boundaries imaginable. Reluctance to recognize the relevance and validity of studies by those who are seeking new frontiers or perspectives with respect to anthropological problems will make these researchers withdraw farther from traditional anthropological orientation, and will inevitably fragment autonomous subdisciplines. "Freezing out" opportunities for exploratory studies of interdisciplinary nature, and leaving these studies to scholars in the related fields involved, will only mean

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that those studies will be undertaken with a minimum of the anthropological insight deemed so crucial by the "traditional" anthropologists (who will not allow their own students to seek the competence offered by interdisciplinary training). Finally, ossification of the goals and boundaries of anthropological thought would surely be disastrous, because any discipline failing to exploit opportunities for growth stagnates.

It should be emphasized that the introduction of new ideas or new dimensions to the curricula of traditional anthropological programs is in no logical way a threat to the mainstream of anthropology. Introduction of fresh insights has never been known to harm any viable system of thought; the threat and the sabotage of existing systems results only when these systems have lost their validity. Moreover, conservatives fears for the integrity of traditional educational programs have proven unfounded historically. The discoveries in nuclear physics have not destroyed the opportunity for classical studies of ancient civilizations. Modern technology has, instead, contributed to the traditional understanding of Greek, Roman and Egyptian civilizations by means of techniques such as neutron activation analysis, radiocarbon dating and thermoluminescence. Doors have been opened, not closed.

Those reluctant to accept changes and opportunities offered by new programs such as the Quaternary studies option at Washington State University often fail to note the implications in deliberately selecting the name for that program. The word "option" clearly indicates that the program is intended to add a new, previously unavailable, dimension to the existing program, and that the option is in no way intended to replace traditional programs. Students wishing to pursue traditional studies previously offered in the anthropology department, or any other department they choose, are both able and encouraged to do so in the most effective and intensive manner possible for them. The new program is merely an enabling act, allowing other students to concentrate on a special aspect of anthropology. That such a program is reasonably limited in time and must result in students having less preparation in linguistics and social anthropology will not harm the field. This is the case because the time not spent in those courses they will recoup by additional time spent in other related areas which the profession

is not now exploiting and from which the profession is consequently at present denied substantial benefit. The ultimate result will be the enrichment of both anthropology and the related fields previously unenhanced by an anthropological viewpoint.

An analogy from the field of art may serve to summarize what has been said with respect to the interdisciplinary dilemma, and also to reassure those who fear fragmentation of anthropology as a result of diversity in training and interests.

In a painting after the manner of the French school of pointillism, the artist makes use of myriads of scattered dots of different colors, which, in their overall effect, produce a finished composition, be it landscape or figure. No matter how unrelated to each other or how peripheral to the central part of the picture the individual points might seem to be, their contributions are as essential, as legitimate and as effective as those of still other points situated closer to the center of the picture.

In anthropology each worker, like the individual dots in the pointillist painting, has a distinctive "color" and "position," that is, a unique approach to his research. Although differing in training and interests, the researchers all contribute—each scholar in his own way—to the sum total of the knowledge comprising anthropology.

Knowledge is a continuum, like the sphere of the earth but with the uninterrupted vastness of a universe. Our formal academic categories are as arbitrary and artificial as the lines of latitude and longitude we scribe on a globe despite the continuity of the earth's surface. Each worker stands within the expanding field of his own perception, with opportunities which are limited only by his interest and imagination, his ability and the time available to him. To fetter his education or his intellectual growth with the boundaries of traditional disciplines is, to say the least, short-sighted. Much better to free each man to his own sphere of professional and intellectual competence, and to benefit from his unique perspective and contributions to knowledge, whether these lie within our arbitrary academic bounds or straddle them.